The Saharan Dust Episode of 29 July 2002: Evidence for the Glaciation of Mildy Supercooled Altocumulus Cloud

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University of Alaska Fairbanks Two-Color Polarization Diversity Lidar (PDL) System*

Current Specifications

Operational	
Wavelength (Nd:YAG)	0.532 + 1.06 μm
Peak Energy	0.35 J each color
Maximum PRF	10 Hz
Pulse Width	9 ns
Beamwidths - Transmitter	0.5 mrad
Receiver	0.2-3.8 mr high-speed shutter
Receiver Diameter	30 cm (2 telescopes)
Detectors - Visible	2 , Gated PMT's
IR	2, SAPD's
Maximum Scan Rate	$5.0° s^{-1}$
Data Handling	
Number of Channels	4 (simultaneous)
Sample Width (resolution)	1.5 m maximum
Range gates	8 k maximum
Pulses Averaged	1 - 10
Maximum throughput	164 k samples/second
Digitizer Resolution	8 bits
Storage	8 mm video tape
Polarization Properties	
Transmitted	Vert. (Vis) + Horiz. (IR)
Received	Vert. + Horiz. (Vis. + IR)

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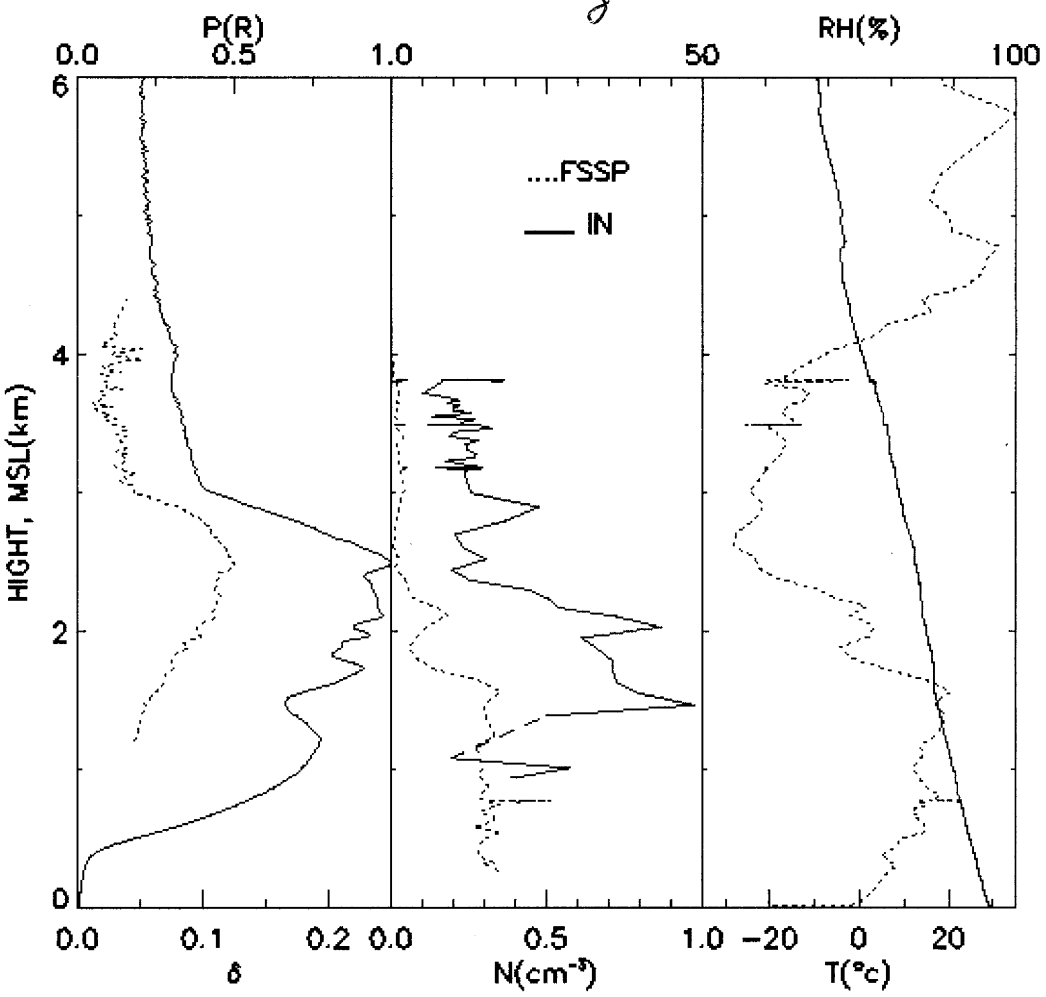
* Additional Equipment

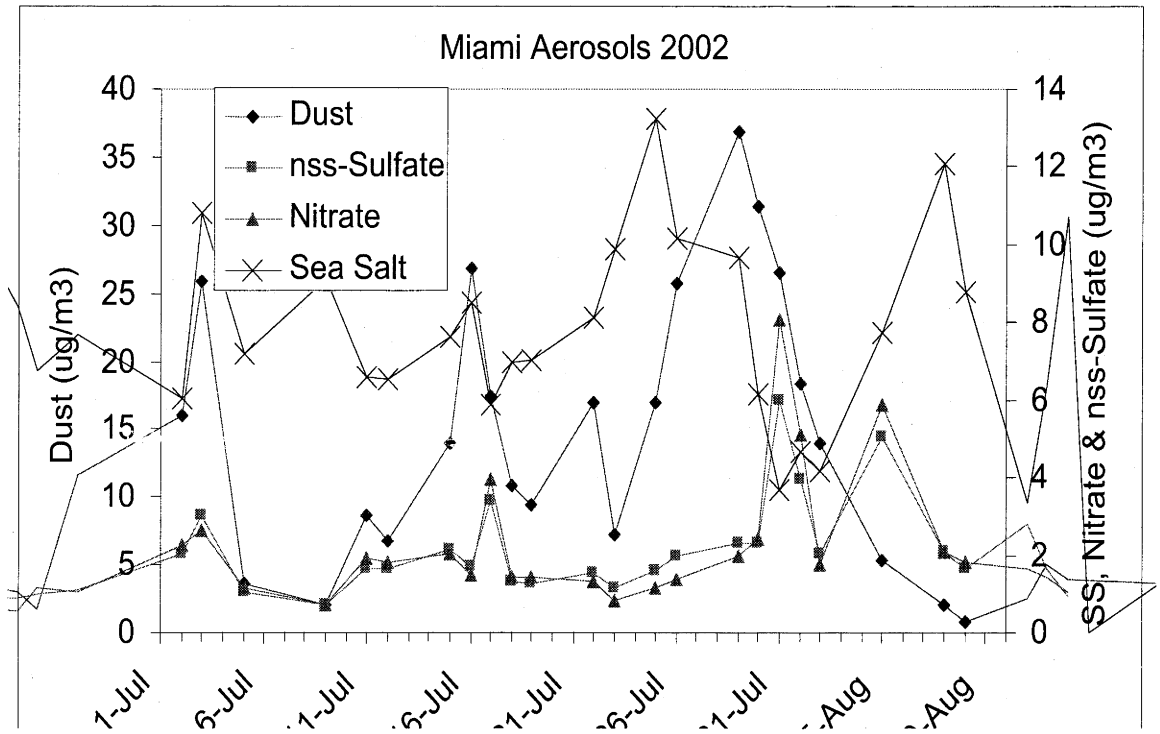
a. All-sky video imager with time-lapse VCR

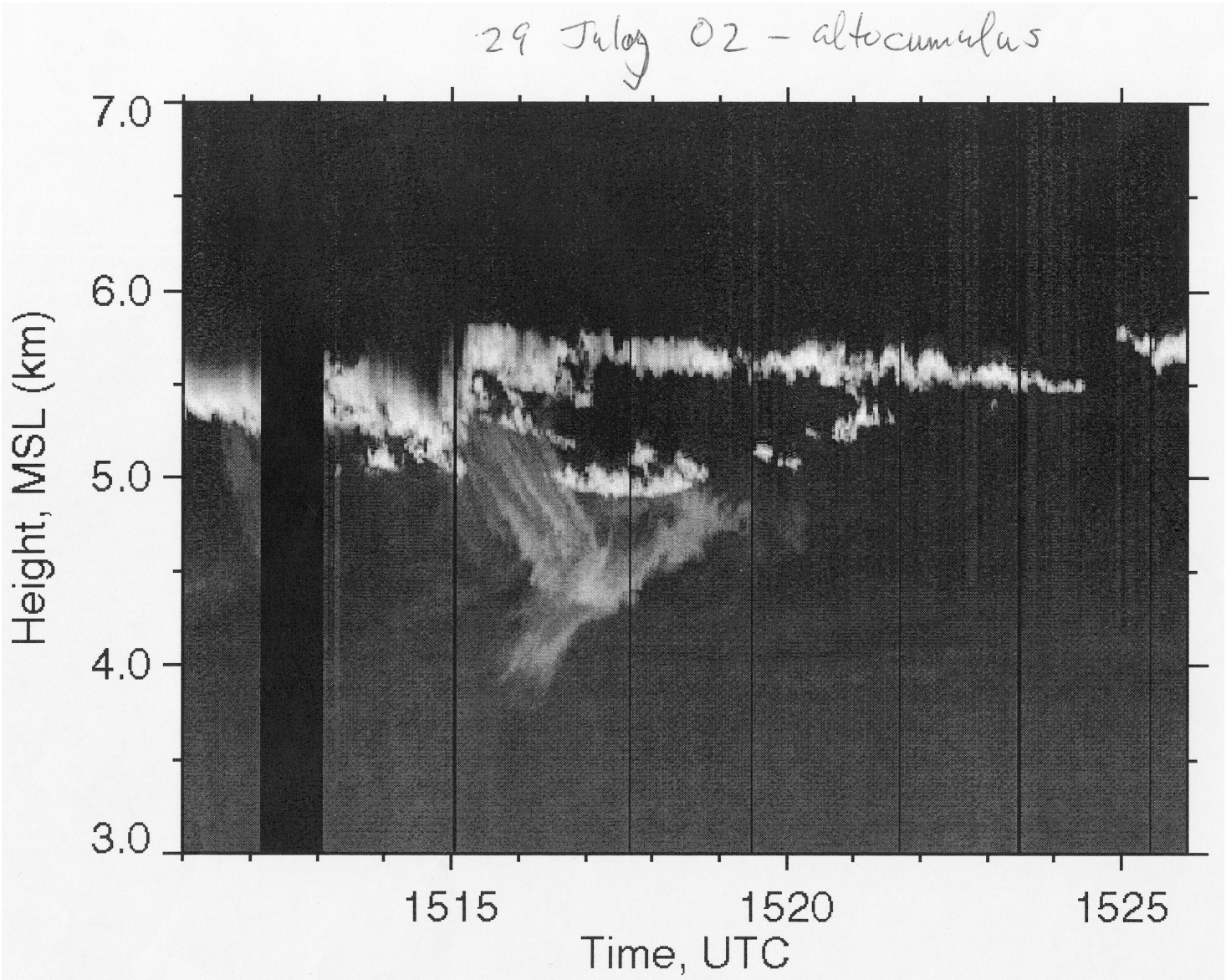
b. PRT-5 narrow-beam (0.14°) mid-IR (9.5-11.5 μm) radiometer +

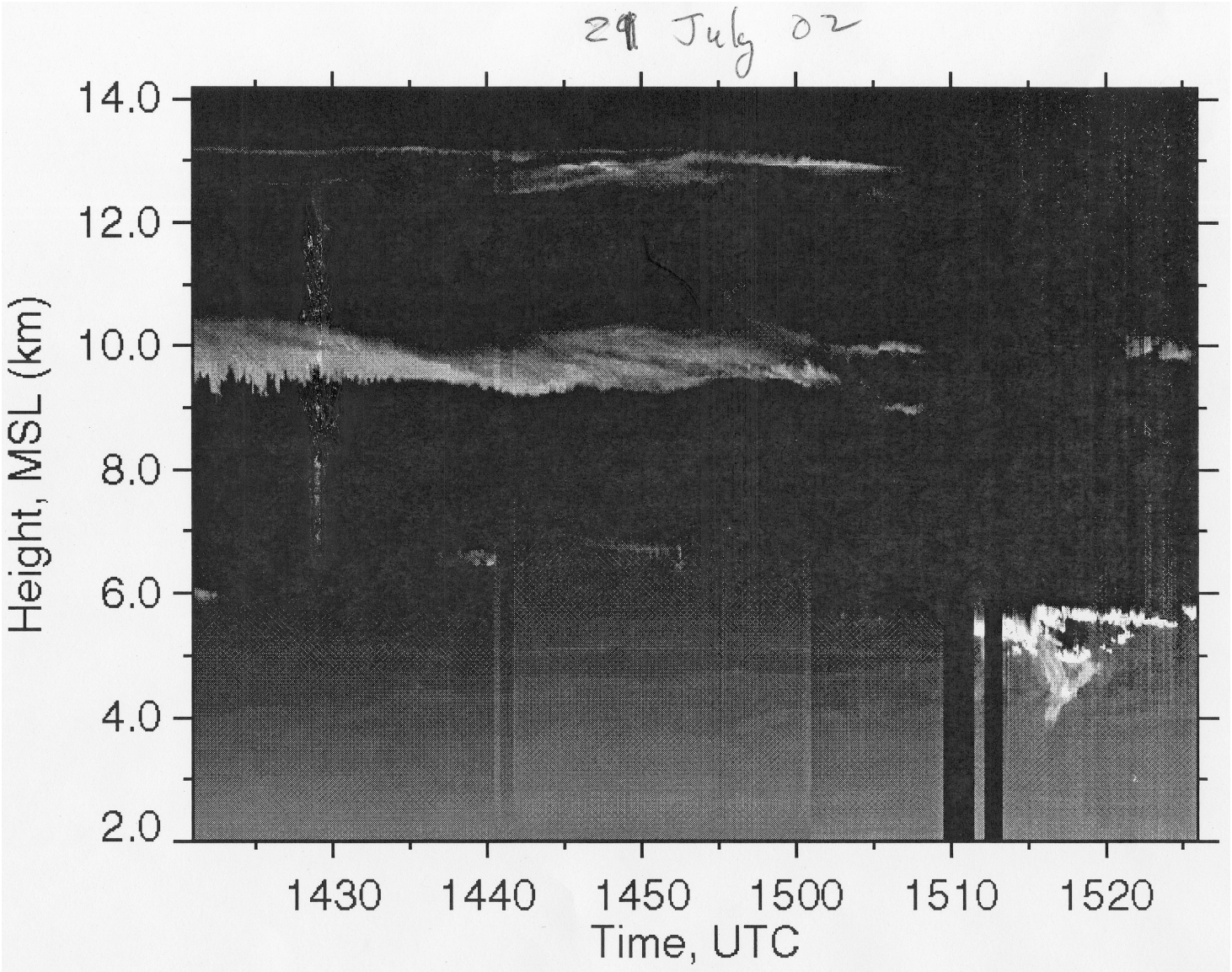
c. Camcorder camera +

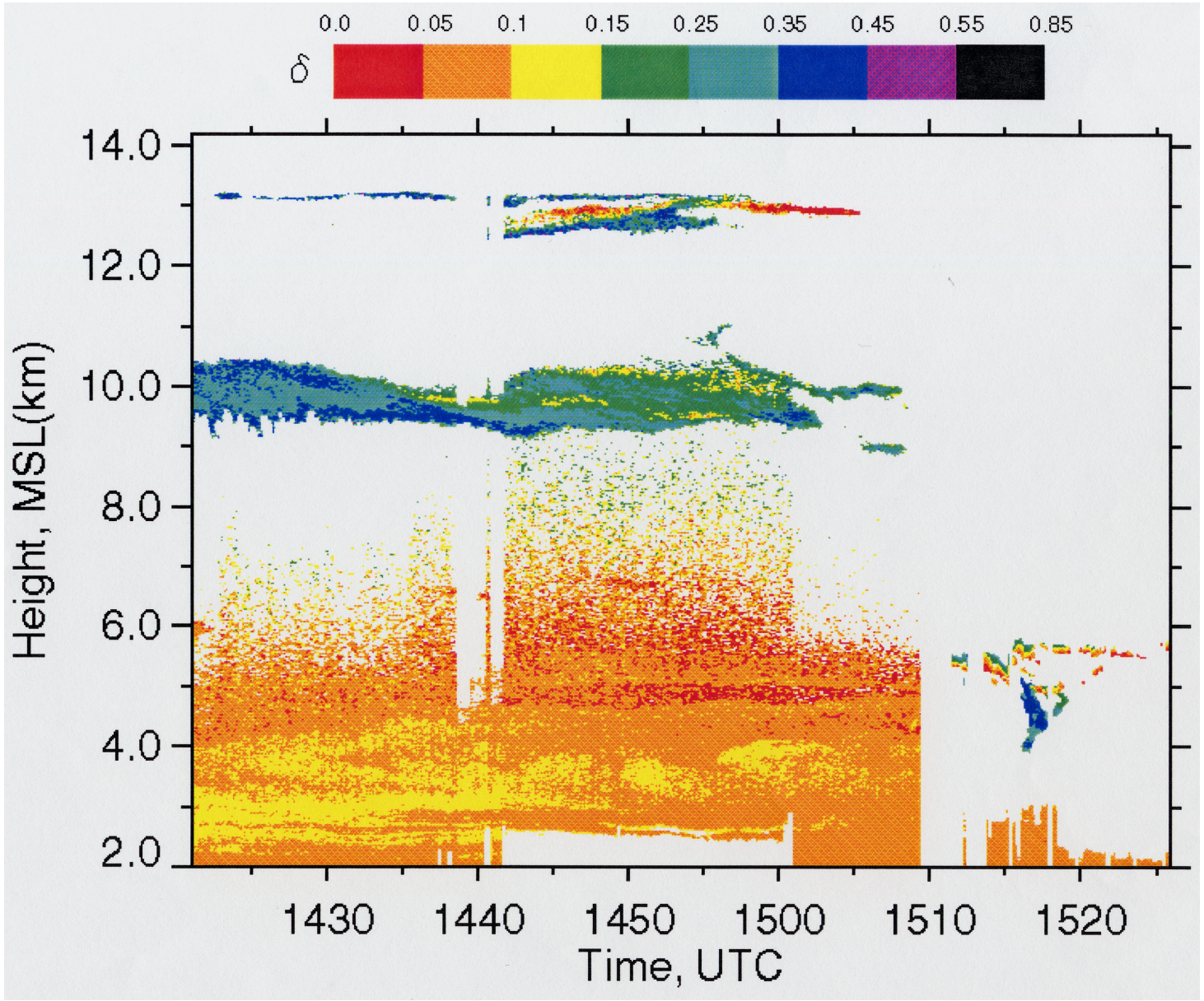
(+ aligned parallel to transmitter on lidar table)

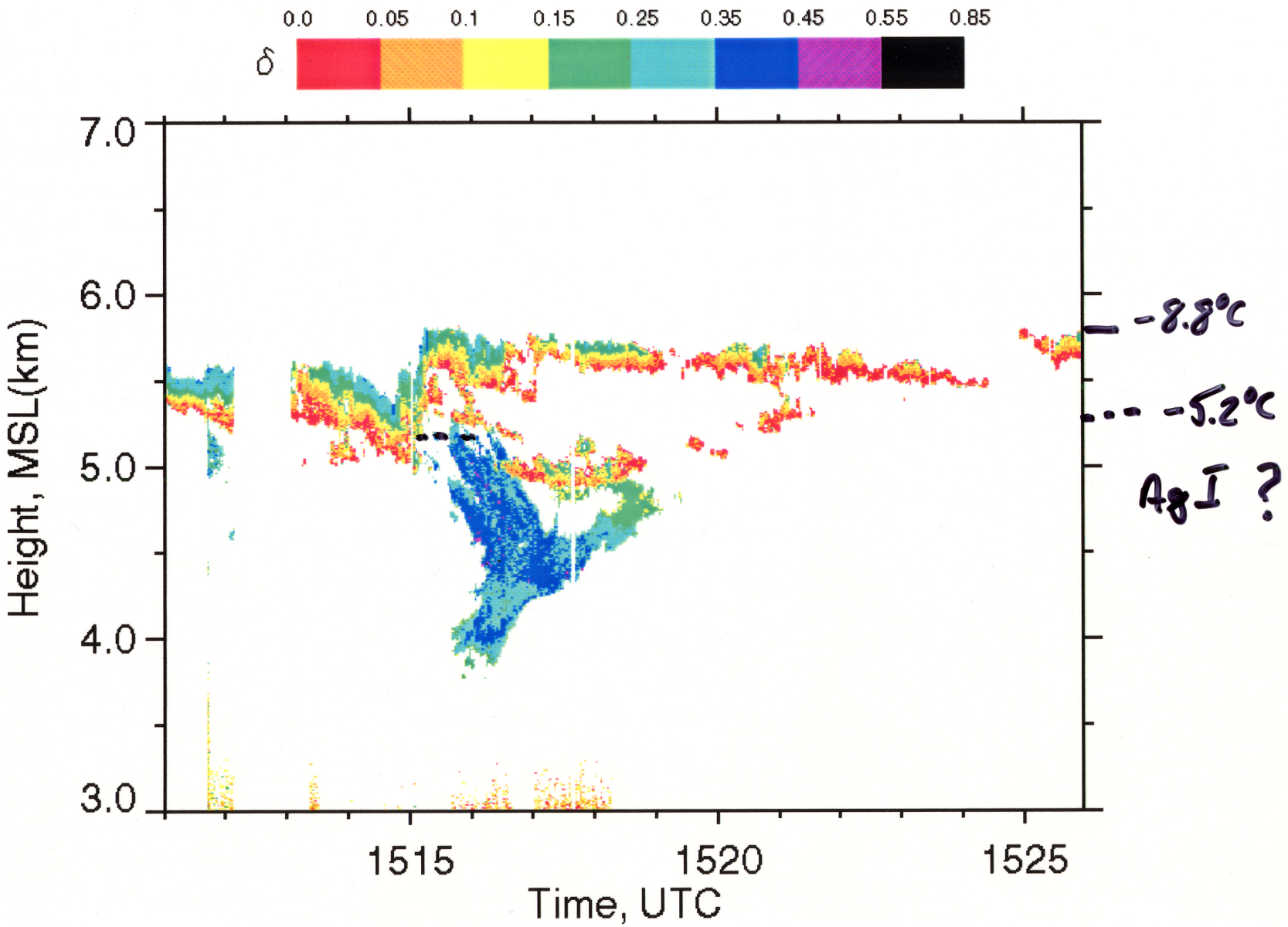

29 July 02
P(R)
0.0
0.5
1.0
RH(%)
50
100
6
4
2
0
HIGHT, MSL(km)
....FSSP
IN
0.0
0.1
0.2
δ
0.0
0.5
1.0
N(cm⁻³)
−20
0
20
T(°c)

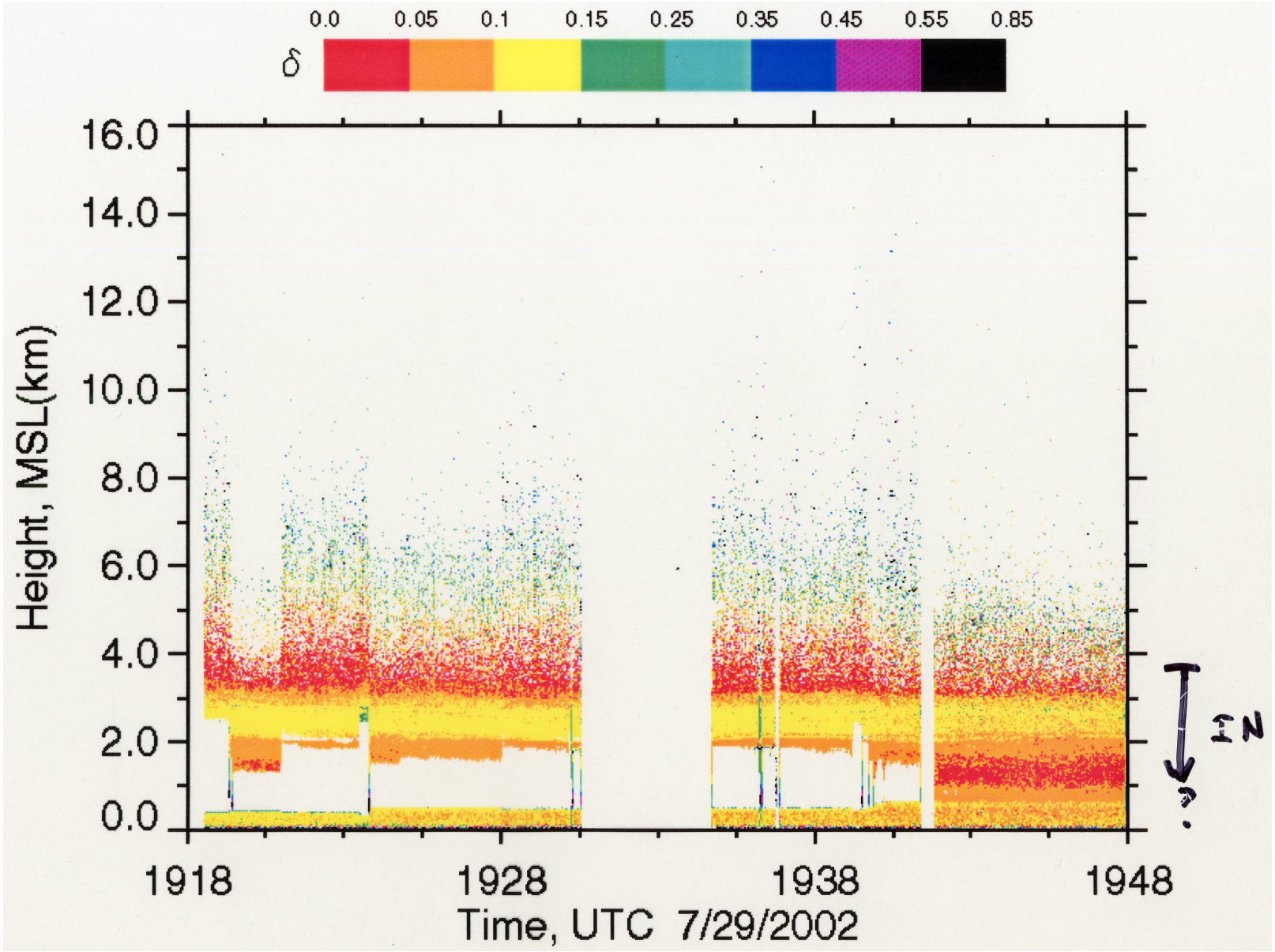

Miami Aerosols 2002
Dust
nss-Sulfate
Nitrate
Sea Salt
Dust (ug/m3)
SS, Nitrate & nss-Sulfate (ug/m3)
40
35
30
25
20
15
10
5
0
14
12
10
8
6
4
2
0
1-Jul
6-Jul
11-Jul
16-Jul
21-Jul
26-Jul
31-Jul
5-Aug
10-Aug


29 July 02 – altocumulus
7.0
6.0
5.0
4.0
3.0
Height, MSL (km)
1515
1520
1525
Time, UTC


29 July 02
14.0
12.0
10.0
8.0
6.0
4.0
2.0
Height, MSL (km)
1430
1440
1450
1500
1510
1520
Time, UTC


δ
0.0
0.05
0.1
0.15
0.25
0.35
0.45
0.55
0.85
Height, MSL(km)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
1430
1440
1450
1500
1510
1520
Time, UTC


0.0
0.05
0.1
0.15
0.25
0.35
0.45
0.55
0.85
δ
7.0
6.0
5.0
4.0
3.0
Height, MSL(km)
1515
1520
1525
Time, UTC
-8.8°C
-5.2°C
AgI ?


0.0
0.05
0.1
0.15
0.25
0.35
0.45
0.55
0.85
δ
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Height, MSL(km)
1918
1928
1938
1948
Time, UTC 7/29/2002
N

CONCLUSION

There may be two distinct types of thunderstorm/anvil Microphysical compositions in the CRYSTAL-FACE dataset:

Those affected by the very inactive IN from Saharan dust aerosol (especially on 28-29 July) in boundary layer, and

Those unaffected by this aerosol